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A

NEW METHOD

OF PROPAGATING

FRUIT-TREES,

AND

FLOWERING SHRUBS,

From their Parts :

WHEREBY

The common KINDS may be raised more expeditiously; and several curious EXOTICS increased, which will not take Root from CUTTINGS or LAYERS.

Confirmed by successful and repeated Experience.

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From Experiments proposed by Dr. HILL.

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A
NEW METHOD
Of PROPAGATING
TREES and SHRUBS.

C H A P. I.

The Occasion and Purpose of this Work.

 HE difficulty of propagating some shrubs in the common way, and the small increase that can be made from others by the usual methods, brought it into my thoughts to try whether some expeditious manner could not be invented of raising a large number.

EVERY NURSEYMAN will be glad to know this: for if he can, when he has got a new shrub, raise twenty or thirty instead of three or four, it will be a great increase for his profit: and in the same way, a GENTLEMAN, when such a thing falls into his hands, will be better pleased to supply all his friends at once, than a few at a time, and not oblige all under the compass of many years. I thought the thing might be done, and that made me resolve not to be disheartened at one or two trials: and my honoured master has encouraged me, by giving me opportunities to make

the experiments, and looking upon their progress himself.

It is about a year since I began the trials ; and between that time and this, I have made them various ways upon four-and-twenty sorts of trees and shrubs of the fruit and flowering kinds ; not trusting to one or two samples of each, but using several dozens of every kind, and trying them in all the different conditions of culture, according to their nature, from the stove to the open air. By these means the experiments amounted to many hundreds ; and as I kept a constant journal of them all, which I have here faithfully transmitted to the publick ; every one will see how far each method succeeded, and which deserves the preference.

C H A P. II.

Of PROPAGATION by the BUD.

THE propagation of trees by layers and cuttings, shews, that if a piece of any kind be planted in the ground in such manner that it takes root below, the upper part will soon furnish all the rest, and become a perfect tree. If roots can be thus obtained, the rest follows in the course of nature. But this is not universal ; for some trees will not take root in either of these ways : and if they would, still the number is but small that can be obtained by them, because it is but a certain part of the branches a tree can spare for that purpose.

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ON examining the cuttings which have failed, I have always found that the mischance happened by the rotting of that part of the cutting which was expected to send forth the roots ; for the danger is where it had been fresh cut, and has no bark to cover it. I thought it natural, that if a method were used to keep that part from decay, all those cuttings would grow, which we usually see fail : and communicating my thoughts to a gentleman of knowledge *, he not only confirmed my opinion by his own, but gave me a receipt for preserving the ends of cuttings from rotting ; and desired me to try it afterwards upon smaller pieces than such as are commonly used ; and upon single buds.

EVERY leaf upon the branch of a tree or shrub, has usually a young bud in its bosom ; and it is certain each of these buds has in it the rudiment of a tree of the same kind : therefore it appeared reasonable to think that every branch might afford as many new plants as there were leaves upon it ; provided it were cut into so many pieces, and this same dressing could prevent the raw ends of each piece from decaying. The advantage of such a practice appeared very plainly, for it must give many plants for one, and the thing seemed so agreeable to reason, that I resolved to try it.

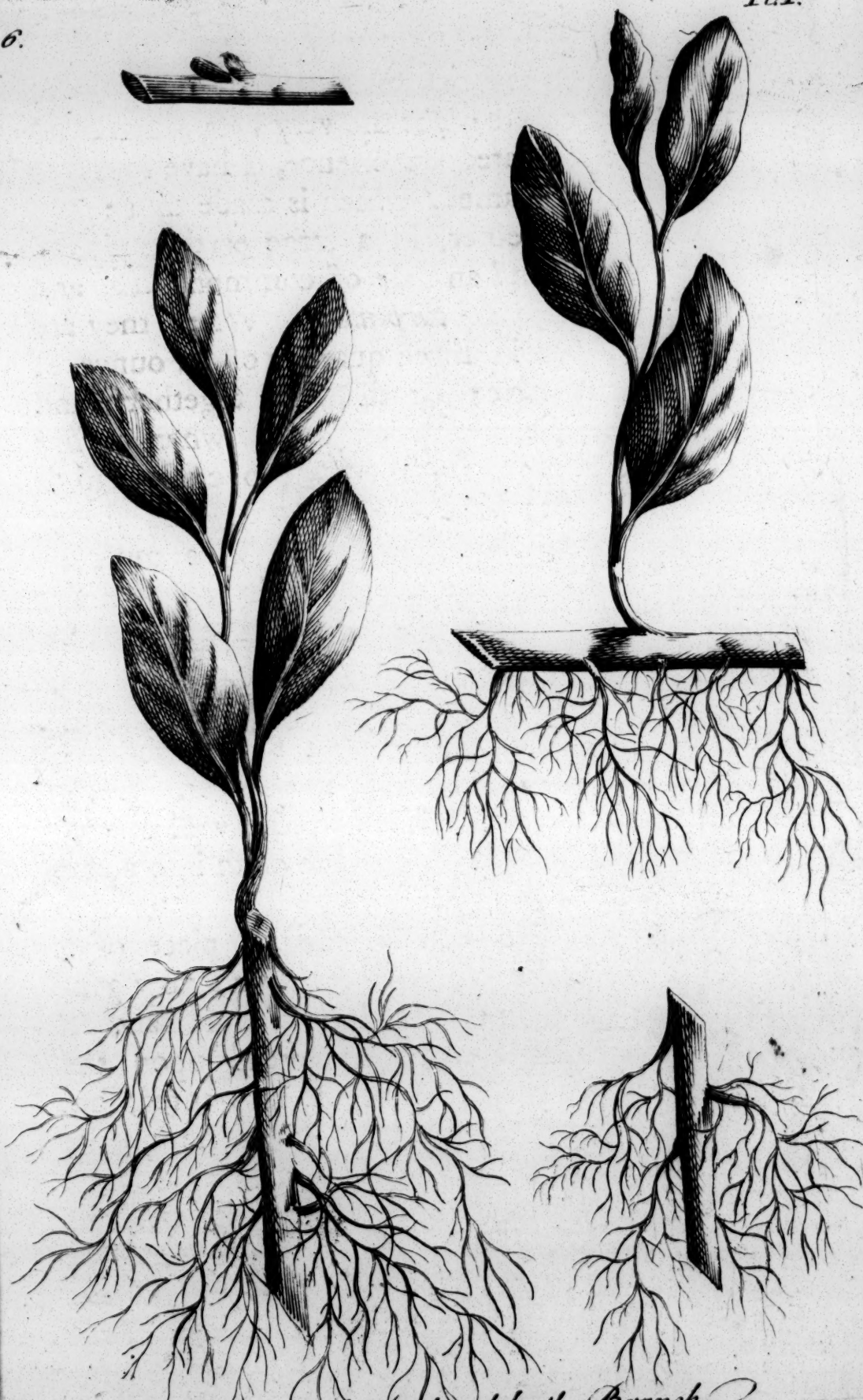
MANY mixtures of resinous substances have been proposed on this head, under the names

* Dr. Hill.

of cements and vegetable mummies, by Agricola and others ; but the very best, upon careful and repeated experience, I have found to be that just named, which is made thus :

MELT together, in a large earthen pipkin, two pound and an half of common *pitch*, and half a pound of *turpentine*. When they are melted, put in three quarters of an ounce of powder of *aloes* ; stir them all together ; and then set the matter on fire ; when it has flamed a moment, cover it up close, and it will go out : then melt it well, and fire it again in the same manner. This must be done three times : it must be in the open air, for it would fire a house ; and there must be a cover for the pipkin ready. After it has burnt the last time, melt it again, and put in three ounces of yellow wax shred very thin, and six drams of mastich in powder. Let it all melt together till it is perfectly well mixed ; then strain it through a coarse cloth into a pan, and set it by to cool.

WHEN this is to be used, a piece of it must be broke off, and set over a very gentle fire in a small pipkin : it must stand till it is just soft enough to spread upon the part of the cutting where it is wanted, but it must not be very hot. It is the quality of this dressing to keep out wet entirely. The part which is covered with it, will never decay while there is any principle of life in the rest ; and this being secured, nature will do the business of growing. This I have found true in practice : and by repeated trials, in more kinds than one, I have found



Propagation by the Root, and by the Branch

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found that I could raise from any piece of a branch, as many good plants as there were leaves upon it.

NOVEMBER the third, 1757, I took off four dozen leaves of the common LAUREL, with the Bud entire in the bosom of each leaf; and every thing being in readiness, I cut the wounded part smooth, whiped it dry, and covered it with some of the dressing. I planted them in four pretty large pots, one dozen in each. The mould in these pots was made extremely fine; and I planted them by making very small openings, and letting in the base of the leaf just so far that the top of the bud might not be wholly excluded from the benefit of the air. I gathered the fine mould carefully about each bud, and pressed it every way close, to keep the bud in its upright position, and prevent the air from coming too easily to the part whence the growth of fibres was to be expected. This was the management of the buds in all the pots.

ONE pot I set up to the rim in garden mould under a warm south wall; another I set in the same manner, but without that shelter; the third I set in the green-house, and the fourth in the stove. The intent of these different places, was to see what effect such variation would take in the growth; the stove naturally inclining all things to shoot sooner.

I gave every one of them the same care and attendance that it was natural to allow to young plants; and no other. They had waterings

waterings in the common course, and those in the open air were sheltered by peas-straw in the severity of the winter.

I examined them JANUARY the fourth. Every bud in the pot which was in the stove had formed a good plant two inches high, and with sufficient roots.

THOSE in the open air were alive, but had made small progress. I examined these last again APRIL the 12th, and almost all of them had made shoots, and had got good root, and were in a fair growing condition.

THESE plants require only the common care afterwards. They are to be removed into a nursery-bed at seven inches high; and they will thus make, by a quick growth, so many handsome shrubs.

THUS I found that as many plants might be obtained as there were buds upon the branch. The experiment may be used to hardy trees of more value; and the benefit of it is very plain.

MARCH 5, 1757, I took off a branch of a white poplar, on which were a great many buds. I cut this into as many pieces as there were buds upon it, cutting the branch through at equal distances between every two buds. I thus had a great many pieces of it, each about an inch in length, with the two ends raw, and with a bud nearly in the middle between them. I smoothed the wounded ends of these, and having some of the dressing ready melted, I wiped them very dry, and spread it all over the cut part of each extremity, leaving the rest of the piece, which was covered

covered with the bark, naked. I planted them in pots in the same manner as the buds of laurel.

APRIL 29, I examined these, and found they had produced so many excellent and healthy plants; every plant was upright, strait, well-looking, and three or four inches high; and they had all very good roots.

IT is easy to see how this experiment may be extended; and perhaps there are very few hardy shrubs which will not succeed happily by it. The laws of vegetation are the same, whether the plant come from an English ditch side, or the edge of an American lake; from the hills of one of these countries, or the mountains of the other: nor is there any reason to suppose those from warmer climates will refuse this course of propagation in the stoves wherein we keep them.

IF this prove true upon experience, which I have happily found in some late instances, here is a method of increase which may be extended to all trees and shrubs that have buds, and we shall be able to raise much greater numbers, and with much more ease, than by any way that is yet known. It became me to try the experiment itself upon the easiest subjects, and such as were most likely to shew its success: for the enquiry was, whether this could be brought about in nature. Others may assist in the extending the experiments to more kinds: 'tis certain the principles of vegetation allow of it.

AT THE SAME TIME that I prepared these buds of the poplar just named, with the parts of the entire branch, I took off some others with only so much of the wood as was sufficient to keep them entire; not cutting the branch through, but only taking the buds from the side of it with a small piece of the bark and wood. I smoothed these parts, wiped them dry, covered them with the dressing, and planted them in pots, in the same manner, and with the same care as the others. They had all the same advantages, but the success was not equal. Some of them made very good plants, but others failed: nor were the plants produced from those which succeeded, nearly so fine as those from the others.

FROM THIS OBSERVATION, I lay it down as a rule, so far as these experiments can support a general maxim, that when buds are to be planted, it is best to allow them the whole thickness of the branch, however small the piece may be.

I LAID these pieces horizontally, with the bud uppermost; and the success was as I have mentioned: it may be worth trying what would be the effect with the pieces planted perpendicular or obliquely, to give the bud a different direction from what it had in my pieces.

MARCH 10, 1757, I took off some healthy branches of the COMMON WILLOW and the WHITE WILLOW: part of these I cut into lengths as the poplar, with one bud in the center of each piece; and from the other part
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I cut out the buds with a piece of the wood to each. I wiped the wounded parts of both dry, covered them with the dressing, and planted them in the same manner as the poplar in all respects.

THE intent of this was to confirm the former experiment by other instances; and as the whole point was to try whether this power was or was not in nature, I again chose subjects the most likely to succeed.

THIS experiment answered exactly as the former: all the buds which had pieces of the entire branches grew; and most of the others. It appeared plainly, that this power of producing trees and shrubs from short pieces of their branches, in each of which there is a bud, is not repugnant to nature, nor limited to one kind: and this shewed farther, that the observation made in the other instance respecting the manner of the operation is true, namely, that the way to succeed best, is not to cut the buds out of the branches, but to cut thro' the branches, and allow each an entire piece, tho' it be ever so short.

THESE were the experiments I made in the last Autumn, and the present Spring, in the propagation of trees by buds; and I invite and request all Gardeners to join with me in prosecuting these trials upon scarce and otherwise valuable kinds.

ALTHO' this practice be new, it is founded in the most plain manner on reason and the nature of things. There is no more wonder that a bud should produce an entire plant,

than that a seed should grow. Each of these contains the rudiment of an entire plant of its kind, and there requires only a proper care in the culture to set it to growing. We do not wonder that the little lumps upon the stalks of the Dentaria, the White Saxifrage, or the Scarlet Lilly, should grow when put into the ground ; and there is the same reason that these buds should, for they contain, in the very same manner, the originals of future perfect plants.

WE do not enough regard the uniformity of nature ; and it is thence our wonder rises. But there is yet another instance in the course of the Gardener's profession, which agrees more exactly with the growth of the bud, than either the seed or the little lump upon the stalk ; this is the common class of bulbous roots. In all these what is called the bulb, is not a root, but a rudiment of a plant surrounded with a great many coats, or a thick substance, by way of defence from the injuries of the air. The roots of the plant are those fibres which grow from its base. The bulb is formed every year, and a new one always succeeds that which had furnished the stalk and flower of the preceding season. A bulb is an embryo plant, covered with films, and fleshy matter, formed under ground upon the base of the root of a plant ; a bud is an embryo shrub or tree, covered with films and scales, in the same manner, and formed in the free air upon the branches of the shrub. They are the very same in their nature and construction ; and in the end they are

are to serve. We see the bulb shoot up a perfect plant, without surprize ; why then should we wonder that the bud will have the same success ? Custom has made the one familiar to us ; the other at present is new ; there is no other difference.

NOTHING could appear so strange as the producing plants from cuttings, when Lauremberg first proposed it to the world, yet what is now more familiar ? The growth of cuttings is of the same nature with this which is here proposed ; and there is reason to believe, that the propagation by single buds will soon be as common : and probably with proper care it will succeed as well in all other trees and shrubs which have buds of a proper kind, as in those here instanced. Many trees and shrubs are destitute of buds entirely ; indeed those from the hotter countries almost without exception ; and in others there are some buds which are destined to the production of some one part of the tree alone, not of the whole : therefore they will not answer the purpose. The Alaternus and the Olean-der, the common Syringa, and the Tamarisk, the Savin and the Sensitive Plant, are instances, among many others, of trees and shrubs which have no buds at all, and therefore do not come within this course of propagation. The Alder has buds for leaves, which contain no rudiments of flowers, and therefore perfect plants could not be produced from them. In the poplar there are distinct buds for the flowers, and others for the leaves ; therefore
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if the flower buds were taken, no success could be expected. The Hazel has its buds, containing leaves and female flowers: the Pine and Fir male flowers and leaves together: how these buds would succeed, is a subject of great curiosity, and is worthy trial: but in general, the bud of a tree contains the rudiment of the perfect tree, and therefore a perfect tree may be produced from it.

THIS is the usual condition of buds, and therefore in the generality of kinds, trees may be produced by this practice with great ease, and in great abundance. There is also, as I think, another very considerable advantage from this method, though the limited number of experiments I have named, does not permit me to affirm it with all the certainty of the other facts. This is, that the trees produced from buds will naturally be handsomer and more vigorous than those raised any other way, except from seeds: for in layers there is a great interruption of the course of the juices; and in cuttings it is uncertain whence the principle of growth will begin to act, so that nature is disturbed in her progress, and the juices receive a check in their current, either of those ways; the effect of which in nature, we see plainly in the growth of the Pine-apple, and many such instances: whereas when the bud is planted, the succeeding tree rises straight from its natural place, and there is no turn given to the juices, nor any check in the growing. From the time the rudiment begins to grow,
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it continues growing; and while it lies in the bud, it is as much at rest as the plant in the seed, till nature sets it to shooting. Art does the same in this process, and the effect is no way different; the tree grows just as the shoot would have grown on the branch. So many buds as there are on a tree, so many perfect trees of the same kind may be produced, if the Gardener takes care of them; for each is a young tree, and no other.

AT a certain distance from the root, the rudiments of leaves, instead of forming separate leaves, like those below, coalesce in their origin, and form a cup; and at the same time, and by the same power, whatsoever it is, (for 'tis hidden from us in itself, tho visible in the effects) the rind and pith of the stalk, instead of continuing the growth in that form for the farther increase of the branch, break out into broad thin coloured parts and 'thready substances, and form the rest of the parts of fructification: a flower is form'd, and seeds follow: that is, the plant ceases to grow in height and length of branches, for nature has given in that respect a certain law to all; and where its parts cease to extend themselves in length, they terminate in the rudiment of a new plant, called a seed.

THIS is the course of natural vegetation. Now art taking its place, produces from the ground that shoot, by planting the bud, which in the common course of things would have been sent from the ends of
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the branches. It would have produced flowers and seeds when it had grown to a very small length in that state, because the height of the stem, and the length of the branch whereon it grew, would have placed it at a due distance from the root: but when it is removed from this situation, and raised by planting the bud immediately in the ground, instead of forming only a short branch, it produces an entire tree, because the rudiments of leaves will never coalesce into a cup, nor will the rind and pith form flowers and seed vessels until the allotted distance from the root is once obtained.

LINNÆUS, who adopts from Loeffling this doctrine of the state of buds, says, He will give a great addition to the science, who shall say what it is that influences the extremities of the plant to burst out into flowers, and to form seeds. If I may offer my humble opinion, it is this: Nature has allotted to every plant, as to every animal, a certain growth or stature which it should not exceed; and the cause of difference in that stature in various plants she placed in their roots.

EVERY root, I imagine, has so much power as is necessary to carry up a plant to a certain height: then it ceases; and therefore there ends the immediate growth of the plant. When the branch can extend no farther, its parts all terminate; not abruptly, for that is not the course of nature in any thing, but each part, according to its kind, terminates in some one of the organs

gans of the flower, and the result of all is a seed ; which being put into the ground will again grow and extend itself, because it gets a new root.

THE plant can grow no higher, because its root can furnish no more force for the ascent of sap ; but the termination of the parts is by a seed, that is a rudiment, which must be put into the ground, and will then get new root, and therefore grow again.

ART, and the practices of the gardener, may interrupt and disturb nature in these operations, and produce vegetable monsters ; but this appears to be her regular course ; and thus it is that a bud, which if it had opened on the tree, would have produced only a short flowering branch, will, like the seed when planted in the ground, grow to the height of the original tree: for the power of the root it gives, is sufficient for that purpose.

A ROOT is required for this, because only the power of that organ can extend and increase the parts ; but nothing more is wanting ; for roots, like the polypes and certain worms, have power even when cut to pieces to reproduce the several parts.

FROM these considerations may be understood all that appears wonderful in the production of plants from the bud, and consequently from their other parts : and we shall see that what appears to be production or propagation, from the parts in general, is the same thing under another form : and that the raising plants by cuttings, is another

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way of operating by the bud, though not so regularly. If this be proved, it is certain that the taking a bud itself will be preferable to the setting it loaded with a part of a branch. The rudiment of a root will strike more readily, when the bud wherein it is contained is placed immediately in the ground ; and the course of the sap will be plainer, shorter, and easier, than when it is to run through a long though useless branch. This is in some degree reducing the Gardener's art to its principles ; and we shall always succeed the better, the more perfectly these are understood.

IF it be true, according to these remarks, that a bud is nearly of the nature of a seed, there can be no doubt of its succeeding the better, the nearer we bring its management to the seed culture. Indeed there is in nature something like an instance of it in the plant *Bisfort*. This produces bulbs upon the stalk, which are a kind of buds ; and these usually fall off, and take root ; but sometimes they will shoot upon the stalk. In the first case they produce perfect plants of the same kind, but in the latter always poor, irregular, and imperfect ones.

C H A P. II.

Of the dressing of cuttings with this cement.

HAVING seen the good effect of this dressing upon the wounded part of these pieces of branches ; that it certainly prevented their

their rotting in the ground, and by that means gave nature time to operate in the upper part of the branch ; I resolved to try its effect upon some cuttings of those tender exotics which are found commonly to fail. It appeared to me, that the only cause of this was the rotting of the lower part of the cutting ; and consequently, that if this dressing could prevent that, it would secure the growth of the shoot.

MR. MILLER, in his Gardener's Dictionary, says, " Some have asserted the coffee-tree would grow from cuttings ; but that " in all the different trials he had made, he " never could obtain one plant that way." Nobody will doubt this author's experience, or that he knew how to manage his cuttings perfectly well : for this reason I fixed upon the coffee-tree for the kind I should first try in my new way.

NOVEMBER the third, 1757, I took off some cuttings of the coffee-tree in the usual way ; I wiped the wounded part very dry, and dressed it with some of the cement just melted so as to run. I planted these cuttings in pots in the common way, and set the pots up to the rim in the bark bed in the stove.

As this was a point of importance, as well as curiosity, I did not think it just to risk the whole upon one trial ; therefore,

NOVEMBER the 28th, I took off some more cuttings from a coffee-tree, dressed them with the same care, and planted them in the same manner

manner in pots, plunging them into the bark bed in the stove.

APRIL 20, I examined these cuttings, and found they were in a very healthy condition.

MAY 16, I again examined them, and they had shot six inches in height, and had got very good roots.

ON the 12th of DECEMBER I took off some slips of the coffee-tree, wiped the wounded part, and dressed them with cement. I planted these in the same manner as the cuttings, and gave them the same care; they succeeded as well, but not at all better than the cuttings. They all furnished very good and healthy plants.

FROM these experiments it appears, that those tender and precious shrubs and trees, which will not grow in the common way from cuttings, may be brought to succeed in this manner: and this is a very considerable use of the dressing here described. It is a nice and difficult article to hit the right ingredients and just proportions: many have failed in various operations, who used such mixtures as were ill made up; but ours will certainly answer this and the former purposes, as well as many others, to be named hereafter.

THAT this effect of the dressing upon the cuttings of tender plants, might be confirmed or refuted by more instances,

APRIL 17, I took off some cuttings of the orange and lemon trees in the common method used in cuttings: I wiped the raw ends very dry, and dressed them with the cement.

I planted

I planted these in pots, and plunged them in the bark bed in the stove.

MAY 28, I examined them, and found they had begun to shoot.

JUNE 20, they had shot three or four inches, and got very good roots.

APRIL 6, to confirm this practice by another instance, I took off some cuttings of the DOUBLE OLEANDER: I wiped the wounded parts, covered them carefully with the dressing, planted them in pots, and plunged them in the bark bed in the stove.

MAY 29, I examined these: they had all done very well; every cutting had shot six inches, and they had all got very good roots.

APRIL 12, 1758, I took off some cuttings of the coffee-tree, wiped the raw part dry, and covered it carefully with the dressing; I then planted them in pots, and plunged them in the bark bed in the stove.

MAY 30, I examined the pots; I found every one of the cuttings had formed a good and thriving plant: they had shot six inches in length, and had got good roots.

THESE experiments shew, that the dressing agrees equally well with the generality of plants, preserving the lower part from decay, and by that means giving nature an uninterrupted course for the nourishment of the shoot above, and time to send out roots from the part below in the same manner; for when nourishment is received, and the vegetable principle is unimpaired, the shooting of roots from the part below the surface,

is as natural as the sending out of branches from above.

It is plain this use of the dressing may be of great benefit, since it will cause many plants to succeed by cuttings, which would not otherwise do that way at all ; and will make others succeed freely and generally, which without this assistance would answer but seldom, and at the best but poorly. The preventing the decay of the bottom of the cutting is the great article ; for when that rots it destroys the whole. The decay of this is like a mortification in animal bodies, as soon as it has seized the part, it spreads and infects, and destroys all.

THIS decay in cuttings is occasioned by the moisture of the ground which affects the raw parts ; but if that be guarded from the mischief, nature does all the rest. The Gardener need only prevent the decay of the cutting, the growth will follow without his assistance.

BUT though the effect of the dressing for this purpose is general, it is not universal : though it will answer with most plants, it will not do with all. This I have found by the like experiments, and it becomes me to acknowledge it : physicians have done the world as much service by giving accounts of diseases wherein remedies failed, as of those in which they succeeded ; and I would not serve this cause, even by silence, where it failed.

APRIL 19, I tried it on the sensitive plant. I took off some cuttings with great caution,

caution, being sensible how difficult it would be to make them succeed : the pots were ready with excellent mould, and the dressing on the fire ; I wiped the raw ends dry, covered them carefully with the cement, and planting them with all possible care, plunged the pots into the bark bed in the stove. They all died.

WILLING to make another trial, that I might be sure wherein this method failed, as well as where it succeeded, on the 28th of MAY I dressed another parcel of cuttings of the sensitive plant in the same manner, using, if possible, more caution than at first, that they might have every possible advantage. JULY 29, I examined the pots, and these were also all entirely dead.

IN experiments on raising the sensitive plant by cuttings therefore, this method fails ; but it is the only plant on which I have hitherto found it ineffectual.

It is plain therefore, that the use of this method will be extremely beneficial, not only for the raising plants from buds, but also from cuttings. That strange writer, Agricola, who first proposed this kind of propagation, has disgraced his work by many falsehoods ; and for that reason, what was true and useful in it, was long neglected ; neither had he the secret of a good cement, nor the great advantage of stoves : so that while, on the one hand, he has ventured to assert much more than is true, on the other he had not opportunities of knowing all that could be done by it.

THAT

THAT author has asserted that trees may be produced from leaves. He says, the tender part between the ribs decays, and the fibres grow up into branches: he has even given relations and figures of orange and lemon trees, and many others, which he says he raised in this manner. Though there was little probability of truth in these accounts, yet being upon the subject, I resolved to give this also a fair trial, using on some leaves of each kind the cement he directs, and on others my own. The result will be found in the following chapter.

C H A P. IV.

EXPERIMENTS *on* LEAVES.

NOVEMBER 3, 1757, I picked four dozen healthy leaves of the common laurel: I took them carefully from the tree, with no buds joining to them: I smoothed the end when they were pulled off with a sharp knife, wiped it dry, covered it with the dressing; and thus preparing them all, I planted them in four middle-sized garden-pots, one dozen in each. Two of these were exposed to the air, the one under a south wall, the other without that shelter, and both set up to the rim in mould; a third I set in the green house, and the fourth pot I plunged in the bark bed in the stove. This last place was chosen to promote the shooting of the fibres, nothing having so great power for that purpose.

THAT

THAT the determination of this point might not rest upon one set of experiments made at only one season, APRIL 12, 1758, I took off two dozen more leaves of laurel, with the same precaution: I dressed them in the same manner, and planted them in a shady border.

MAY 29, 1758, I took off a third parcel of laurel leaves, and dressing them as the others, planted them also in a shady border.

AT the same time I examined those of the NOVEMBER planting, and found them all dead in all situations.

APRIL 19, I took off some healthy leaves of orange and lemon trees; cut the raw ends smooth, wiped them dry, covered them with the cement, and planted them with all possible care in pots of good mould, and plunged them in the bark bed in the stove.

FROM time to time I gave these all possible advantages for promoting their growth.

MAY 29, I examined them; they were all dead, without any attempt to shoot out fibres.

MAY 30, I selected another parcel, prepared and planted them with the same care, and gave them all the possible advantages for growth.

JULY 29, I examined them, and found them all dead; no one having made any attempt to shoot out any fibres.

THAT this might not rest upon one species in the stove, I determined to try also the coffee-tree.

APRIL 27, I took off some very fine and fresh leaves from a healthy coffee-tree, smoothed the raw ends, covered them with cement, and planted them in pots. I set these in the bark bed in the stove, gave them all the same advantages with the others, and on searching them, MAY 30, I found them all dead.

DURING the course of this experiment, on the 16th of MAY, I took off another parcel of the coffee-leaves, dressed them with the same care, and planted them in the same manner.

JUNE 27, I examined them, and found them all dead.

ALL this time the laurel-leaves of the several Spring plantations remained in the ground; and I bestowed on them the common care, being determined to omit nothing that might give fair play to the experiment; nor to take up any leaf till it should be evidently dead.

AUGUST 26, 1758, I examined carefully those leaves which had been planted in APRIL, MAY, and JUNE, removing the mould a little from them. It is certain some of them have shot a few fibres from the lower part of the foot-stalk. What will be the result, is impossible to say; the prospect of success is very little; but the question is not fully decided.

Since this I have found by trials at Bayswater that Lady-smock will grow from the leaf, and there are some others.

J. HILL.

C H A P. V.

*Of PROPAGATION of TREES by parts of the
ROOTS.*

FROM the success of the method of propagation by small pieces of the branches of trees, it is natural to conceive that smaller or larger pieces of the roots will answer the purpose ; and the same author who has treated of the last experiment, mixing truth with falsehood, has named also this.

REASON is very fairly on the side of the experiment. We see that roots, wherever they reach the surface of the ground, shoot up into young trees ; and we find, by manifold experience and observation, that the difference between roots and branches, is little more in nature, than that the one are buried under ground, the other kept above it. This new method of propagation depends upon one principle, namely, that the rudiments of new plants are lodged in all parts of the old, and are ready to grow from them to perfection, whenever they have proper advantages. Therefore it should appear to reason, that if a piece of a root can be kept from decaying in the earth, it will produce one or more new plants. This I proposed to try by the following experiment :

NOVEMBER 3, 1757, I raised carefully by opening the ground, a large horizontal root of the WILLOW-LEAVED BUCKTHORN. I

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trimmed

trimmed off all the side shoots; and cutting the two ends smooth, wiped them perfectly dry, and covered them with the dressing all over the raw parts; not only the two ends, but the several places also from whence I had cut the side shoots and large fibres. I opened a trench in a bed in the nursery long enough to receive the whole piece, and laid it in horizontally, and covered it an inch deep with mould, not raising a ridge over it, but keeping the place on a level with the rest of the bed.

APRIL 12, I examined this ground, and found a great many shoots rising up at different distances from the whole length of the root.

APRIL 30, many of the shoots have got six inches high, and all appear very vigorous.

MAY 20, several of the shoots are a foot long, and promise to make very strong and fine plants.

JUNE 27, I took up the entire root, and cut it into as many pieces as there were good shoots: thus every young plant had a piece of the large root for its base, and a multitude of small fibres newly shot.

I WIPED the two raw ends of every piece, covered them carefully with the dressing, and just trimmed the extremities of the new fibres.

I planted them in a shady border in the nursery, and occasionally watered them. I have so many fine plants. These seemed in danger at the first removal, and I believe it would

would be better hereafter, when plants are thus raised, to let them stand till the next Spring before they are moved.

To try whether the roots of trees would not produce new shoots as well when cut to pieces, as in the entire length,

NOVEMBER 3, the same day with the first experiment, I took up another root of the same shrub, and cut it into pieces of two or three inches in length; I smoothed the raw ends of each piece, took off the side shoots, and covered the two raw ends, and all the small wounds made by taking off the fibres, with the dressing. I planted them, at the same time, with the entire root in the nursery, and gave them the same care. The success was the same.

JUNE the 28th, they had all shot up one or more new plants. I took them up, took off all but the best shoot, and planted them in the nursery, where they are now growing. That this experiment might not rest upon one trial, or seem appropriated only to one plant; on the same day, NOVEMBER 3, 1757, I took up two roots of a Virginian Acacia, which was in good health, and could spare them without danger. One of these I dressed entire, the other I cut into pieces of two or three inches long; and covering all the wounds with the cement, I planted them in the same manner as the others, in an open part of the nursery, laying them lengthwise in a shallow trench, and covering them an inch with mould.

IN

IN frosty weather I threw a little peas-baulm over the ground.

APRIL 24, I examined the ground, and found young plants rising from almost all the small pieces of the root, and a great many from the entire one.

MAY 20, I had from these roots a great many fine plants of a foot or more in height.

JUNE 27, I took up the large root, and cut it into as many pieces as there were good plants; I wiped these dry at the ends, and covering them with cement, planted them out in the nursery. They succeed very well; but required care at first. It will be best to let these plants all stand till the next Spring before they are removed.

To try whether the root would succeed best naked, or with the fibres about it, the same day, NOVEMBER 3, 1757, I planted a root of the Sallow thorn, and another of the Virginian Acacia with their fibres. These are no hindrance, and they appear to me to be an advantage. The great point is securing the root from decaying at the two wounded ends; for if that be prevented perfectly, nature will do all the rest.

THE pressing down the mould about the root when first planted, is a very necessary caution; and in the course of the experiment, the place must be kept moist with due waterings. According to the more or less hardy nature of the shrub the root will require more or less shelter and defence in winter; and with this management there is no doubt of perfect success.

AT the same time that I made these experiments on the roots of European and American ornamental shrubs, I was determined to try it also on fruit trees.

NOVEMBER 3, 1757, I took up two long pieces of the spreading roots of an apple-tree, beginning at some distance from the stem; and opening the ground all along, that I might get up the extreme part of the roots, with their small divisions. One of these I cut into lengths, and the other I left entire, not cutting off the side shoots or fibres from either. I smoothed the wounded ends with a sharp knife, and covered them perfectly with the dressing or cement just made warm.

I opened a trench in a bed of the nursery, and laid them in, covering them an inch over the upper part, with mould pressed well down in every part about them. I allowed these the same care as in the former instances, and they succeeded as well.

APRIL 7, 1758, I examined the ground; several young plants appeared both from the entire roots and the pieces.

MAY 20, 1758, many of the new plants had shot a foot high, and were very vigorous and promising.

JULY 27, I took up the entire root, cut it into as many pieces as there were good plants; and wiping their raw ends dry, covered them with cement, and planted them out in the nursery.

THEY prove very good plants.

THE

THE pieces of the root planted at the same time succeeded also very well; and having been transplanted into the nursery, are now good plants.

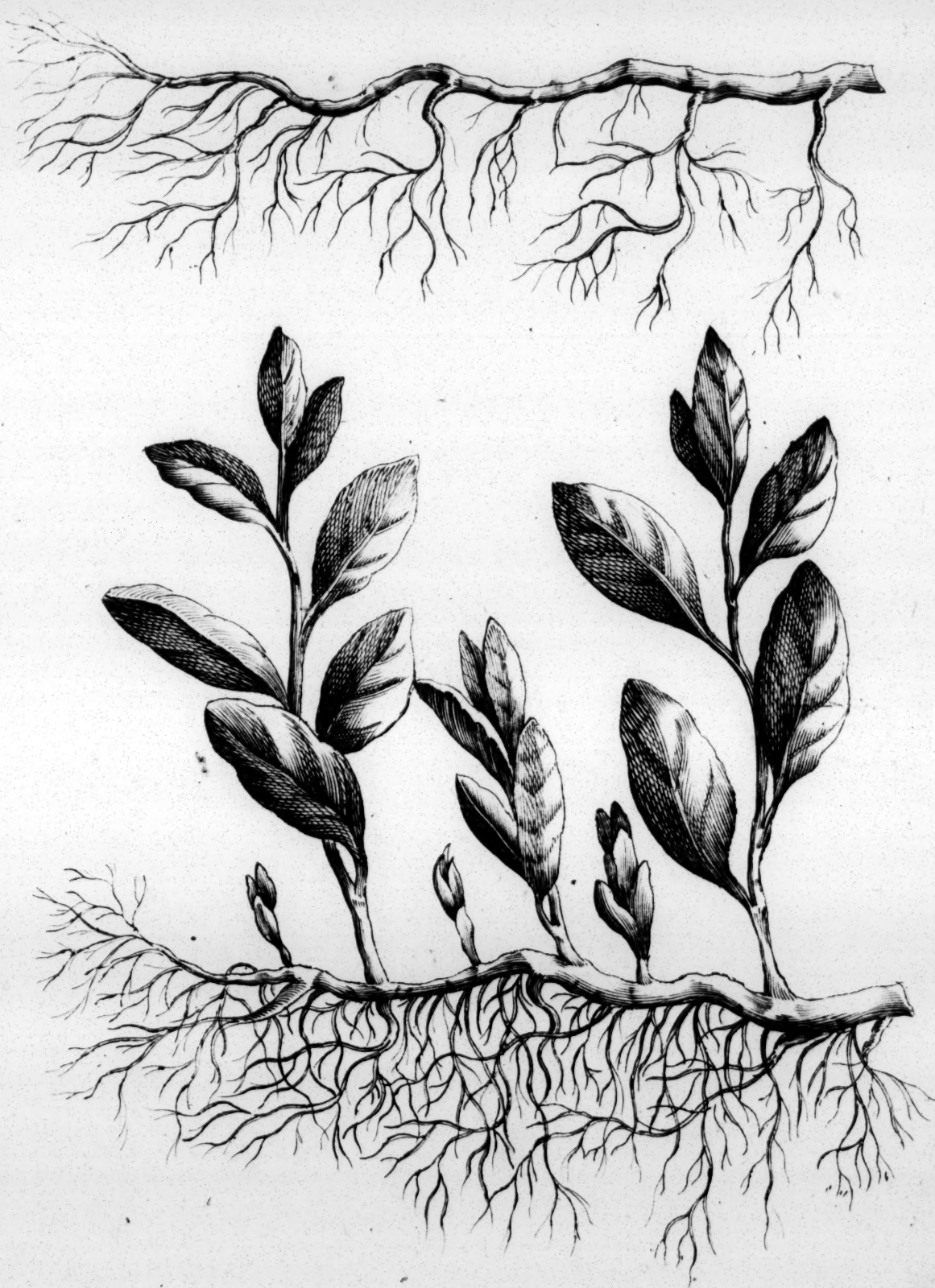
AT the same time, NOVEMBER 3, 1757, I took up two handsome pieces of the root of a pear-tree, and managed them in the same manner exactly as those of the apple-tree in the former instance. They were planted in the same manner, and had the same success. That which had been laid in the ground entire, I cut in JULY into as many pieces as there were good plants upon it, and the others I trimmed of all shoots but one to each. The wounded parts I wiped dry, and covered with cement, and planting them in the nursery with the common care, they are all now thriving plants.

THAT this experiment, which may be useful to Nurserymen, and all who desire to raise a great number of plants, might not rest upon so few kinds, I extended it at the same time to several other trees and shrubs.

NOVEMBER 4, 1757, I cut off some roots of the Elm, the Oak, the Cherry, the Plumb-tree, the common White-thorn, and the Platanus: some of these I planted in the whole lengths, and others in each kind I cut into short pieces, covering with cement the wounded parts, and planting them in the same manner as those before mentioned, and the success was also the same.

APRIL 30, I examined the ground, and found they had all sent up vigorous shoots.

MAY



Propagation by the Root

10 FE 58

MAY 26, most of them had shot a foot or more in length, and were very promising. These I treated in the same manner as the preceding; and as many of them as I chose to preserve, are now fine plants.

I AM of opinion, however, in regard of these as well as the others, that if they had been suffered to remain till the next Spring before they were removed, they would have done better, and with less trouble.

C H A P. VI.

Of PROPAGATION by large BRANCHES.

THE same kind of reasoning, which led us to believe that the roots, or pieces of roots, would raise young plants, being very naturally extended to the branches, I was determined to try what would be the success upon experience. The difference between roots and branches being very little, the same method may be used for one as for the other.

NOVEMBER 12, 1757, I took off a branch of an apple-tree, and rubbed away so many of the buds, as to leave them only at three inches distance, or thereabout, and as much as could be all on one side of the branch. I smoothed the end, wiped it dry, and covered it with the cement, as also the places where the buds had been rubbed off. Thus prepared, I laid the branch in a trench opened in the nursery, in a bed of good mould, and covered it an inch, pressing the mould very well about it.

APRIL 27, 1757, I examined the ground, and found a great many very fine plants coming up.

MAY 26, they had shot fix or eight inches, and got good roots.

JUNE 12, the plants being all very vigorous, I took up the branch, cut it into as many length as there were plants, covered both ends with cement, and planted these in a shady bed in the nursery.

JUNE 30, I examined the plants, by removing a little of the mould, and found they had got fresh root. They succeed very well; but probably would have done yet better, if left in the ground with the entire branch till the succeeding spring.

AT the same time that I began these last experiments on the Apple-tree, I tried also the Pear.

NOVEMBER 12, 1757, I cut off a handsome branch of a Pear-tree, rubbed off a part of the buds, and smoothing the wounded end with a sharp knife, I covered it with the cement, as also the places where the buds were rubbed off. I planted this in the same manner as the other, and with the same success.

JUNE 12, I took up the branch, cut it into as many lengths as there were good shoots, and planted them out in the nursery, cementing first the two wounded ends. They are all now living, and are thriving plants.

To extend this experiment to other kinds of shrubs and trees, I made choice of the Sallow Thorn, Elm, and the Virginian Acacia. The result

result was different, and I shall give it separately.

NOVEMBER 9, 1757, I cut off a branch of the Sallow Thorn, or Sea Buckthorn, rubbed off a part of the buds, smoothed the wounded end with a sharp knife, and covered that part, and the places where the buds had been, with melted cement, I planted this in a trench in the nursery, in a bed of good mould, as the others.

APRIL 7, several very good plants appeared.

MAY 20, I cut the branch into several pieces, each having a good shoot; and covering the two wounded ends with cement, planted them in another bed. They are all now good and healthy plants.

APRIL 20, 1758, I cut off in the same manner some branches of an elm-tree, and planted them with the same caution in a shady border of the nursery.

JUNE 29, I examined the ground: they had all taken root, and there were a great many good shoots from them.

NOVEMBER 15, 1757, I cut off a good branch of the Virginian Acacia, smoothed off the wounded end, wiped it very dry, and covered it with melted cement. I planted this in the same manner, and with the same care as the other, covering the ground in frosts with peas-haum, and removing it when milder.

APRIL 30, I examined the ground; nothing was seen coming up; but on removing a little of the mould, the branch appeared to be alive.

JUNE 12, I examined it again: the branch was quite dead, and there had been no appearance of any shoot from it.

THIS method by the branches of trees, is but a different way of raising by the bud, but we feel it is not universal; though it will succeed with the far greater part of plants. The Gardener may understand by this, that when he would try a new method of any kind whatsoever, he should not limit his experiments to one sort of plants, nor be discouraged at their failing in one species. It is plain, that the same method may be successful in one instance which fails in others.

AS to the branches and pieces of branches laid horizontally in the ground, they will thus produce plants of a good kind; so will at any time pieces of them, cut to a proper length, secured from rotting in the wounded parts, and placed in an erect position.

FEBRUARY 6, 1758, I cut off some shoots of an Apple-tree a foot long, and took a piece of the old wood with them, I smoothed the raw parts, covered them with cement, and planted them in a bed in the nursery, at six inches distance, leaving only an inch of the shoot above the ground. I gave them the common advantages of new planted things, and watered the bed at times.

MAY 27, I examined these; they had all succeeded perfectly well; they had taken good root, and shot about six inches in height.

MARCH 7, 1758, I repeated the experiment upon some shoots of the Pear-tree. I cut these off, in the same manner, at about a foot

foot long, and took a piece of the old wood with each. I smoothed the ends, covered them with the cement, and planted them in the same manner in a bed in the nursery.

MAY 26, I examined them; they had all shot about six inches in length, and had got very good roots. They are now so many very fine plants.

THAT this experiment might not be limited to the fruit kinds, I chose the common Elm for another instance.

FEBRUARY 6, 1758, I cut some shoots of the Elm in the same manner, with a piece of the old wood to each: I smoothed the raw ends, and covered them with cement, and planted them exactly as the others, in a bed in the nursery.

MAY 27, I examined the ground, and found they had all shot five or six inches in height, and were stout and flourishing plants, having all good roots.

THIS tends to confirm the general doctrine upon which these experiments were all established; which is, that any part of a tree which can be preserved from rotting when in the ground, will send up a new plant of the same kind; and that the danger of decay is not in any of the parts covered with the bark, but only in those which have been new wounded. It appears that the cement or dressing here directed, will preserve those parts; and therefore that by its means trees and shrubs may be produced from all their parts.

I SHALL close this little work by a method not altogether of the same kind with these;
but

but as it will succeed in several cases, where the common way fails, it may not be unworthy of the notice of Gardeners.

C H A P. VII.

A Way of raising TREES from the Root.

TO raise a new plant from the root of those kinds which will not take as layers, or grow from cuttings, I use this method: I lay open the earth over one of the roots of a thriving tree, of half an inch diameter, or more, according to the nature and growth of the tree: in small and tender trees, smaller roots will do. I raise this out of the ground, cutting it two-thirds through, and trim off all the side fibres for about six or eight inches of the root: then I dress all the wounded parts with the cement just warmed, and keep the wounded part of the root for about five inches length out of the ground, supporting it by a forked stick.

THUS it has the advantage of its own fibres, and of the general vegetation and growth of the tree, all the time that it is thus kept up above the ground. It has been said before, that the branches and roots of trees differ in nature no other way, than as the one are under ground, and the other in the open air; and therefore this part of a root being raised into the air, what grows from it will be of the nature of a branch or shoot, not of a root. The Spring is the best season for doing this; and if due care be used, it will always succeed.

There

There will be young shoots produced from the part that is in the air. These should stand till the next Spring to be well established, and they may then be cut off, and will readily and certainly succeed.

I HAVE raised in this manner plants of the Double Oleander, the Cotton-tree, and of several other kinds, the most difficult to be raised by the usual methods of culture.

THUS have I laid down what experience has shewn me, upon frequent and repeated trials, relating to the methods proposed by others, and used in my own practice, for raising valuable trees in abundance, and in an expeditious method; and I hope my brother Gardeners will find the advantage. They may indeed do much more; for though the experiments I have made amount to several hundreds, yet they have been limited to only a few species out of that almost infinite variety nature has thrown before us. These experiments may be easily repeated, in these kinds, and new ones may be made upon the same principles. Perhaps also the few I have made unsuccessfully, may, in the hands of some others, be crowned with success; for nature is very various; the event of experiments frequently depends upon little circumstances in particular cases which are not seen; and which, though they have prevented it in one place, may not occur in another. Even the Sensitive plant may, perhaps, rise from cemented cuttings under some other hand.

FINALLY,

FINALLY, the great question relating to the growth by leaves, is not yet decided. I shall with care observe, and mark again those which at the publication of this little work seem to give tokens of life, and shew some root. I shall also repeat the experiments on various other leaves, and hope others will join me in these trials. The thing seems strange; but who can say, what is, or what is not, in the power of Nature!

F I N I S.
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